

Patent claims

1. Direct synthesis process for preparing etherified melamine resin condensates with average molecular weights of from 500 to 50 000, the melamine resin condensates are free from hydroxymethyleneamino groups bonded to the triazine rings of the melamine resin condensate and from $\text{-NH-CH}_2\text{-O-CH}_2\text{-NH-}$ groups linking triazine rings
- 10 characterized in that
- a) in the first step of the reaction, an etherified melamine resin precondensate is prepared in alcoholic solution,
- 15 b) in at least one vaporization step, the concentration of the etherified melamine resin precondensate in alcoholic solution is increased, $\text{C}_4\text{-C}_{18}$ alcohols, diols of the type represented by HO-R-OH and/or tetrahydric alcohols based on erythritol being added to the melamine resin precondensate prior to, during and/or after the concentration-increase process,
- 20 c) in a second step of the reaction, the increased-concentration melamine resin precondensate is reacted, using a mixer, in particular a kneader.
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2. Direct synthesis process according to Claim 1, characterized in that, after the second step of the reaction, the etherified melamine resin condensate is discharged and pelletized.
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3. Direct synthesis process according to Claim 1 or 2, characterized in that the alcohol in the first step of the reaction is methanol.
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4. Direct synthesis process according to at least one of the preceding claims, characterized in that, in

the first step of the reaction, the methylation of the melamine takes place with subsequent etherification.

- 5 5. Direct synthesis process according to at least one of the preceding claims, characterized in that, in the first step of the process, formaldehyde is used in the form of formalin solution at variable concentration and/or paraformaldehyde.
- 10 6. Direct synthesis process according to Claim 4, characterized in that the methylation takes place at a pH of from 7 to 9 and the etherification takes place at a pH of from 5.5 to 6.5.
- 15 7. Direct synthesis process according to at least one of Claims 1 to 4, characterized in that, in the first step of the reaction, the methylation and the etherification take place simultaneously.
- 20 8. Direct synthesis process according to Claim 7, characterized in that the first step of the reaction takes place at a pH of from 5.5 to 6.5.
- 25 9. Direct synthesis process according to at least one of the preceding claims, characterized in that the first step of the reaction takes place in the presence of acidic, or of a mixture of acidic and basic, ion exchangers.
- 30 10. Direct synthesis process according to at least one of the preceding claims, characterized in that, in the first step of the reaction, a reaction temperature of from 70 to 160°C, in particular from 95 to 100°C, is
- 35 established.
11. Direct synthesis process according to at least one of the preceding claims, characterized in that the

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first step of the reaction is carried out using a
melamine/formaldehyde molar ratio

of from 1 : 2.0 to 1 : 4.0.

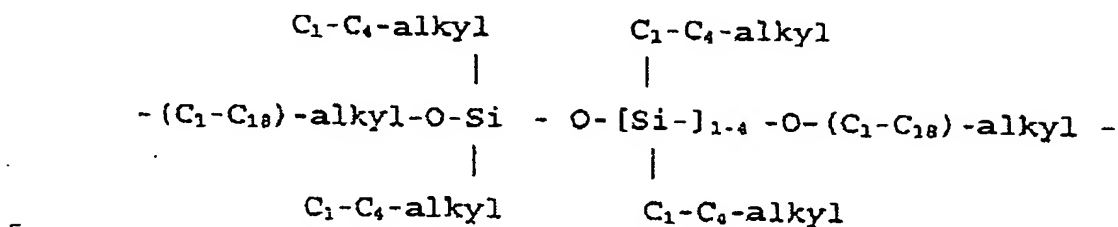
12. Direct synthesis process according to at least one
of the preceding claims, characterized in that the
5 increased-concentration melamine resin precondensate
obtained after the vaporization process has a
concentration of from 95 to 99% by weight.

13. Direct synthesis process according to at least one
10 of the preceding claims, characterized in that the
vaporization of the low-molecular-weight components
takes place in two stages.

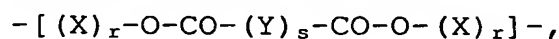
14. Direct synthesis process according to at least one
15 of the preceding claims, characterized in that use is
made of at least one diol represented by the type HO-R-
OH with molecular weight of from 62 to 20 000 or of a
mixture of at least two diols represented by the type
HO-R-OH with molecular weights of from 62 to 20 000,
20 where the substituent R may have one of the following
structures

C₂-C₁₈-alkylene,
-CH(CH₃)-CH₂-O-(C₂-C₁₂)-alkylene-O-CH₂-CH(CH₃)-,
-CH(CH₃)-CH₂-O-(C₂-C₁₂)-arylene-O-CH₂-CH(CH₃)-,
25 -(CH₂-CH₂-CH₂-CH₂-CH₂-CO-) _x-(CH₂-CHR) _y-
-[CH₂-CH₂-O-CH₂-CH₂]_n-,
-[CH₂-CH(CH₃)-O-CH₂-CH(CH₃)]_n-,
-[-O-CH₂-CH₂-CH₂-CH₂-]_n-,
-[(CH₂)₂₋₈-O-CO-(C₆-C₁₄)-arylene-CO-O-(CH₂)₂₋₈]_n-,
30 -[(CH₂)₂₋₈-O-CO-(C₂-C₁₂)-alkylene-CO-O-(CH₂)₂₋₈]_n-,
where n = 1 - 200; x = 5 - 15;

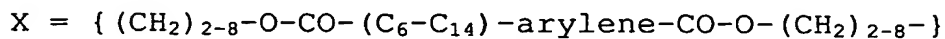
sequences which contain siloxane groups and are represented by the type



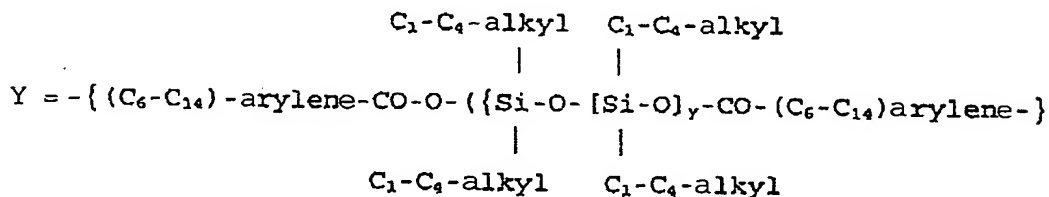
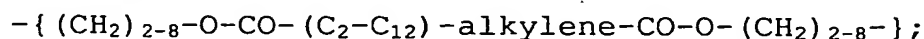
polyester sequences which contain siloxane groups and are represented by the type



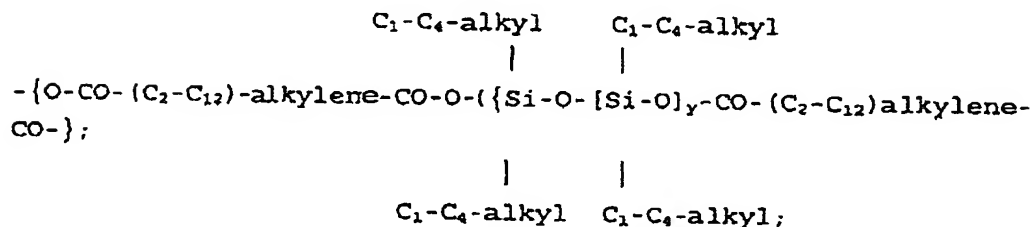
where



or

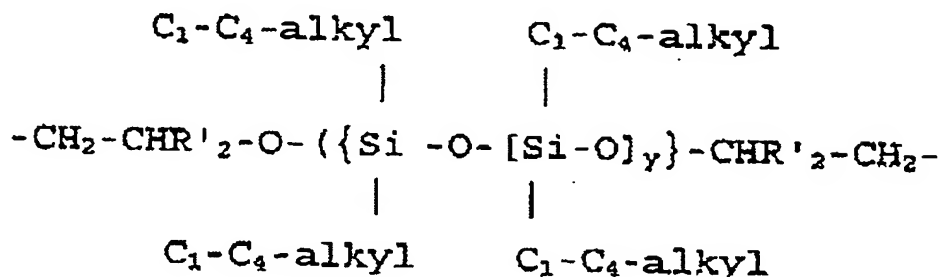


or



where $r = 1 - 70$; $s = 1 - 70$ and $y = 3 - 50$;

polyether sequences which contain siloxane groups and are represented by the type



5 where $R'_2 = \text{H}$; $\text{C}_1\text{-C}_4\text{-alkyl}$ and $y = 3 - 50$;

sequences based on alkylene oxide adducts of melamine and represented by the type of

10 2-amino-4,6-di-($\text{C}_2\text{-C}_4$)alkyleneamino-1,3,5-triazine sequences

phenol ether sequences based on dihydric phenols and on $\text{C}_2\text{-C}_8$ diols and represented by the type of

15 $\text{-(C}_2\text{-C}_8\text{)alkylene-O-(C}_6\text{-C}_{18}\text{)-arylene-O-(C}_2\text{-C}_8\text{)-}$ alkylene sequences.

15. Direct synthesis process according to at least one of the preceding claims, characterized in that the etherified melamine resin condensates are mixtures with
20 average molecular weights of from 500 to 2500 composed of tris(methoxymethylamino)triazine and its higher-molecular-weight oligomers.

16. Direct synthesis process according to at least one
25 of the preceding claims, characterized in that, prior to and/or during the concentration-increase process, i.e. prior to the first and/or prior to the second vaporizing stage and/or after the concentration-increase process, i.e. prior to the second step of the
30 reaction, anhydrides and/or acids dissolved in alcohols or in water are added to the melamine resin precondensate.

17. Direct synthesis process according to at least one of the preceding claims, characterized in that the kneader is a continuously operating, at least to some extent self-cleaning, extruder with vacuum venting.

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18. Direct synthesis process according to at least one of the preceding claims, characterized in that the kneader used comprises a twin-screw extruder with vent zones.

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19. Direct synthesis process according to at least one of the preceding claims, characterized in that, in the continuous kneader, up to 75% by weight of fillers and/or reinforcing fibres, other reactive polymers of the type represented by ethylene copolymers, maleic anhydride copolymers, modified maleic anhydride copolymers, poly(meth)acrylates, polyamides, polyesters and/or polyurethanes are also incorporated, as are up to 2% by weight of stabilizers, UV absorbers and/or auxiliaries, each weight being based on the etherified melamine resin condensates.

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20. Direct synthesis process according to at least one of the preceding claims, characterized in that the first step of the reaction is executed in a stirred tank or in a continuous reactor.

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21. Direct synthesis process according to at least one of the preceding claims, characterized in that the process is carried out either continuously or batchwise.

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22. Direct synthesis process according to at least one of the preceding claims, characterized in that the melamine resin condensates are free from hydroxymethyleneamino groups bonded to the triazine rings of the melamine resin condensate

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and from $\text{-NH-CH}_2\text{-O-CH}_2\text{-NH-}$ groups linking triazine rings.

23. Use of etherified melamine resin condensates
5 prepared by a direct synthesis process according to at
least one of Claims 1 to 22 for processing in the melt,
in particular in the form of hot-melt adhesives and for
producing sheets, pipes, profiles, injection mouldings,
fibres, coatings and foams, or for processing from
10 solution or dispersion in the form of an adhesive,
impregnating resin, surface-coating resin or laminating
resin or for producing foams, microcapsules or fibres.

24. Melamine resin products, produced via a melamine
15 resin condensate etherified using a direct synthesis
process according to at least one of Claims 1 to 22.